

CERRO GRANDE FIRE FLOOD FIGHT PLAN

SANTA CLARA PUEBLO SITES

PART 1-ADVANCE MEASURES AND EMERGENCY TECHNICAL ASSISTANCE PLAN

PURPOSE: Proposed is a two-part plan for the threat of potential flooding from approaching monsoon rains at Los Alamos County, Santa Fe County, Department of Energy, and tribal land. The threat was created by the Cerro Grande fires of May 2000 that burned off the vegetation from the steep canyon slopes and baked the soil, which may dramatically increase the amount of runoff from the upcoming monsoon rains. The second part of the plan (see Bureau of Indian Affairs Emergency Plan later in this report) is intended to present flood fighting, monitoring, communication, and evacuation suggestions that will augment the Santa Clara Indian Reservation emergency contingency plans.

AUTHORITY: The United States Army Corps of Engineers (Corps) is authorized to provide technical assistance and project construction that is requested by and funded by other federal agencies (i.e., Department of Energy, Bureau of Indian Affairs, Department of the Interior, Federal Emergency Management Agency).

Public Law (PL) 84-99 provides authority for the Corps to perform activities designed to protect against loss of life and damages to urban areas and/or public facilities due to flooding. Assistance activities to prevent damages may be taken prior to a flood.

SANTA CLARA PUEBLO REQUEST FOR ASSISTANCE: The Santa Clara Pueblo requested that the Corps review existing infrastructure facilities on tribal lands in anticipation of the July monsoon rains. Runoff from these rains in the Santa Clara Creek and Sawyer Creek watersheds is anticipated to be up to ten times the discharge that would be normally experienced due to the deforestation caused by the Cerro Grande fire. Sawyer Creek will likely contribute significant flow due to the large percentage of burned area in its watershed. Based on the design storm (LANL 100-year 6-hour and Corps hydrologic modeling of flows out of Santa Clara and Sawyer Creeks), the flows in Santa Clara Canyon downstream of the Sawyer Creek confluence are estimated at approximately 1,850 cubic feet per second (cfs).

Areas of concern to the Pueblo included potential flooding of urban areas, adequacy of drainage structures, irrigation water supply systems, and sewage facilities. The locations of potential flood fight measures are shown on Figures 1 through 5. The following sites were visited in the field on 19, 23, and 28 June 2000.

SITE NO. SC-1: Irrigation structure crossing Santa Clara Creek just upstream from the confluence of the Rio Grande River

A. Facility Description: A concrete box culvert, 5 feet wide by 2 feet high, traverses under the creek bed. The length of the box culvert, from toe to toe of levee embankment, is 87 feet. Flow

is controlled via an intake structure. During anticipated high volume flows, concern was expressed that this structure may be washed out. Its present condition shows signs of erosion along the downstream face of the box culvert. Broken up concrete rubble is currently in place. Also, adjacent to the intake structure, the existing levee is lower. This is due to vehicles crossing the creek bed at this location and at another location approximately 500 feet upstream.

B. Flood Control Recommendations: (See Figure 6) The downstream face of the concrete box culvert should be protected by placing stone protection slushed with concrete (commonly called grouted riprap). The existing concrete rubble may have to be removed due to its improper size and gradation. Also, the levee embankment will need to be raised 500 feet upstream.

C. Additional Requirements: None.

D. Schedule: An approximate time for completion of this work is one to two weeks.

SITE NO. SC-2: Sewage ponds/lagoons

A. Facility Description: Three sewage ponds are located behind the right levee embankment. Concern was expressed that this area may suffer inundation during the projected high flows.

B. Flood Control Recommendations: (See Figure 7) Due to this facility being located in the flood plain, it is paramount that the runoff remain in the channel and that the levee embankment on the right bank does not fail or be overtopped. It is recommended that the right embankment be armored with wire-wrapped rock mattress. The approximate levee dimensions are as follows: 2700 feet length, 15 feet height, 10 feet crest width, 2H:1V embankment slope.

C. Additional Requirements: None.

D. Schedule: A preliminary estimate for the construction of this project is approximately four to six weeks.

SITE NO. SC-3: Kee Street Bridge over Santa Clara Creek

A. Facility Description: A concrete box structure, with seven 10 foot by 10 foot bays, carries local Kee Street traffic over Santa Clara Creek. Three bays on the left downstream side have erosion undercutting the concrete slab by approximately 1 foot. An existing gabion structure or wire riprap has been displaced at this location. On the left upstream approach, the toe of the levee embankment has been washed out for approximately 150 feet.

B. Flood Control Recommendations: (See Figures 8, 9, & 10) Erosion areas at the three left downstream bays should be repaired with stone protection slushed with concrete (grouted riprap). The upstream left approach levee embankment will be reconstructed (see SC-4 below).

C. Additional Requirements: None.

D. Schedule: A preliminary estimate for the construction of this project is approximately two to three weeks.

SITE NO. SC-4: Bridge over Santa Clara Creek, Highway 30

A. Facility Description: A concrete box structure, with seven 10 foot by 10 foot bays, carries Highway 30 traffic over Santa Clara Creek. Houses are located on the upstream right bank and downstream right and left banks. Gas lines are located on the downstream right abutment. The right levee embankments, looking downstream, have stone protection on them.

B. Flood Control Recommendations: (See Figures 9 & 10) The left channel levee slopes should receive stone protection (anchored wire-wrapped rock mattress), between the two bridges for approximately 1,100 feet and just past the school and playground for an additional 300 feet. Total estimated length is approximately 1,400 feet. Levee embankment reconstruction will be required as shown in Figure 9 and Figure 10 or designated in the field. This includes 140 linear feet of toe embankment reconstruction just upstream of the Kee Street Bridge, restoring the levee embankment along the right downstream reach where a vehicle access road exists, and raising low areas along the crest adjacent to the Santa Clara Neighborhood Facility for approximately 600 linear feet. In addition, a 20 linear foot diversion dike is to be constructed approximately 150 feet upstream of the Kee Street Bridge. Filter cloth is required under the wire wrapped rock mattress and the rock mattress should be keyed into a 2-foot toe trench. Restored embankment areas that do not receive wire-wrapped rock mattress shall receive seeding and mulching.

C. Additional Requirements: None

D. Schedule: This work is estimated to take approximately 4 to 6 weeks to construct.

SITE NO. SC-5: Low water crossing with irrigation pipe crossover and trailer homes located upstream of Highway 30 bridge

A. Facility Description: The channel at this location is unimproved. Concern was expressed that high flows may affect the trailer homes in this area. Just downstream of the low water crossing is a wire fence. With expected high volume flows laden with debris, this fence will likely catch debris and back up, causing a potential for additional flooding downstream.

B. Flood Control Recommendations: (See Figure 11) The wire fence should be removed to avoid collection of debris that would act as a temporary dam. If such collection occurred and then burst, it could result in higher flows downstream.

C. Additional Requirements: A review of hydraulic and hydrologic data for Santa Clara Canyon by Corps engineers on the Flood Fight Advanced Measures Team, however, suggests that the trailer park's elevation is sufficiently high enough to avoid the anticipated increased flows.

D. Costs: No contractor costs were associated with this item because it can be accomplished with tribal forces.

E. Schedules: It is estimated that this work could be completed within one day.

SITE NO. SC-6: Irrigation diversion inlet

A. Facility Description: Water is diverted from Santa Clara Creek through a series of settling basins and into a buried concrete structure. Upstream of this structure, on the right bank, is a water gage station with a concrete weir.

B. Flood Control Recommendations: (See Figure 12) Due to the nature and functional aspects of this facility, this structure will be flooded during the design storm. To minimize damage to the settling basin retaining walls, it is recommended that sandbags be placed on the downstream side.

C. Additional Requirements: None.

D. Costs: No contractor costs were associated with this item because it can be accomplished with tribal forces.

E. Schedules: It is estimated that this work could be completed within one day.

SITE NO. SC-7: Irrigation intake structure

A. Facility Description: A concrete intake structure is located adjacent to Santa Clara Creek.

B. Flood Control Recommendations: (no figure shown) Due to the nature and functional aspects of this facility, this structure will be flooded during the design storm. No flood control measures can be made at this time.

C. Additional Requirements: None.

D. Costs: NA

E. Schedules: NA

SITE NO. SC-8: Abandoned well #3

A. Facility Description: An abandoned concrete block pump house has two access doors, one facing upstream and the other facing downstream. The wellheads were intact but the pump was missing. The upstream door was ajar.

B. Flood Control Recommendations: (See Figure 13) Although this facility is abandoned and no longer in use, it is recommended that it be protected so as the wellheads are not damaged and/or contaminated by the flood waters. Therefore it is recommended that standard highway

Jersey barriers be placed at the upstream face of the building to deflect the debris-laden flows. Also, the upstream access door should be reattached and sandbags should be placed at the bottom of both doors.

C. Additional Requirements: None.

D. Costs: No contractor costs were associated with the implementation of this protection because it can be accomplished with tribal forces.

E. Schedules: It is estimated that this work could be completed within a few days.

SITE NO. SC-9: Two active water wells with power poles

A. Facility Description: Two wellheads and associated power poles are located approximately one mile downstream of where Route 60 crosses Santa Clara Creek. These areas have already been protected with sandbags and rock diversion structures.

B. Flood Control Recommendations: (See Figure 14) Although these wellheads are protected with a single row of sand bags (originally placed for fire protection), additional sand bags will be required for flood protection.

C. Additional Requirements: None.

D. Costs: No contractor cost is associated with this item because it can be accomplished with tribal forces.

E. Schedules: It is estimated that this work could be completed within one to two days.

SITE NO. SC-10: Entrance to Santa Clara Canyon Park

A. Facility Description: Adjacent to the entrance to Santa Clara Canyon Park exist twin 60-inch corrugated metal pipes (CMP). The culverts are currently clear, although a large dead tree was lying across the upstream approach. Adjacent to these culverts is a capped potable water well.

B. Flood Control Recommendations: (See Figure 15) The dead tree needs to be removed and the potable water well needs to be protected with sandbags.

C. Additional Requirements: None.

D. Costs: No contractor costs were associated with this item because it can be accomplished with tribal forces.

E. Schedules: It is estimated that this work could be completed within one day.

SITE NO. SC-11: Pin Dee Dam (Dam #1)

A. Facility Description: Pin Dee Dam is an earth and random fill embankment dam. It is

the lowermost of a series of four dams on Santa Clara Creek. Its approximate height is 20 feet and has a reported storage capacity of 20 to 30 acre-feet. The crest of the dam is approximately 300 feet long with a width of 10 to 12 feet. The slopes are estimated to be 3H:1V upstream and 2H:1V downstream. The spillway is located on the right abutment and is approximately 60 feet wide. The outlet works consists of a submerged 24-inch-diameter CMP conduit extending beneath the dam and along a discharge channel, which conveys flow to Santa Clara Creek. The dam is currently drained. Flow is being diverted along the right upstream bank through the uncontrolled spillway channel.

B. Flood Control Recommendations: (See Figures 16 & 17) Review of the topographic data reveals that the basin above this area has experienced minimal deforestation (in the range of 10%). Therefore it is perceived that flows coming into this facility would only be slightly greater than normal. However, as determined by the hydraulic model, the design storm (100 year 6 hour duration) may cause this facility to be overtopped. That is, water will overflow the dam crest causing erosion of the downstream embankment that could lead to a possible failure. Therefore, the following options are presented:

1. No action. Since this facility has functioned adequately in the past, no action would be required at this time. The reservoir is currently drained and some storage capacity could be accounted for in reducing the overall projected flows for the first event. Subsequent events would not account for any storage capacity due to sediment and debris buildup. Maintenance procedures would then have to be implemented to remove any sediment or debris after each significant rainfall. Other procedures should continue to be followed regarding monitoring this facility during and after any high intensity storms to determine its structural integrity.

2. Assuming the reservoir is laden with sediment and debris, the design storm would make the uncontrolled spillway flow full and the dam overtopped by approximately one half foot to one foot. To prevent overtopping, which, as previously discussed, could cause dam failure, it is recommended that two feet of sandbags be placed along the entire length of the dam crest, (from the left abutment to the uncontrolled spillway).

3. Another method of preventing erosion of the downstream embankment would be to install 10 mil plastic over the existing slope. The negative aspect of this option is that once debris starts to flow over the dam the plastic could tear. Subsequent exposure would cause erosion with eventual failure.

C. Additional Requirements: Based upon prior inspections and recent site visits, noticeable seepage was observed at the 24-inch CMP outlet conduit. Although the reservoir was drained, water was flowing from this area. The source of this flow could not be determined, but could possibly be attributed to local springs or seepage coming from flow passing through the uncontrolled spillway. At any rate, it is recommended that the 24-inch CMP be extended 20 feet and a 30-foot-wide by 7-foot-high berm be constructed over this extension. The berm side slopes should tie into the existing berm on either side of the pipe. The berm should be constructed out of 12 inches of fine to coarse sand, then by placing 12 inches of pea gravel (3/4 inch), then 2.5 feet of coarse aggregate (1.5 inch top size) and finally 2.5 feet of 4 to 8 inch coarse aggregate with a top size of 8 inches. This repair should be considered only as a temporary patch and not as a permanent fix. The dam should be evaluated (as outlined in the last inspection report, dated

September 1998) and permanent repairs made as soon as possible. Prior to these permanent repairs, this dam should be monitored during and after any high intensity storms to determine its structural integrity.

D. Schedules: NA

SITE NO. SC-12: Weinpovi Dam (Dam #2)

A. Facility Description: Weinpovi Dam is an earth and random rock fill embankment dam. It is the third dam from the uppermost structure in a series of four dams on Santa Clara Creek, approximately one half mile upstream from Pin Dee Dam (Dam #1). The dam height is approximately 25 feet and an estimated storage capacity of 14 acre-feet. The crest of the dam is approximately 285 feet with a width of 20 to 25 feet. The slopes are estimated to be 3H:1V upstream and 2H:1V downstream. The spillway is located on the right abutment and is approximately 60 feet wide. The outlet works consists of a gated 24-inch-diameter CMP conduit extending beneath the dam and discharging into the original stream channel. The dam is currently drained. Flow is being diverted along the right upstream bank through the uncontrolled spillway.

B. Flood Control Recommendations: (no figure shown) Review of the data reveals that the basin above this area has experienced minimal deforestation, (in the range of less than 10%). Therefore it is perceived that flows coming into this facility would only be slightly greater than normal. Because this facility has functioned adequately in the past, no action is recommended. Normal procedures should continue to be followed regarding monitoring this facility during and after any high intensity storms.

C. Additional Requirements: None

D. Costs: NA

E. Schedules: NA

SITE NO. SC-13: Nanaka Dam (Dam #3)

A. Facility Description: Nanaka Dam is an earthen structure constructed out of locally available materials. It is the second dam upstream from the uppermost structure in series of four dams on the Santa Clara Creek. The dam is located approximately 7 miles upstream from Pin Dee Dam (Dam #1). The dam height is approximately 25 feet with an estimated storage capacity of about 24 acre-feet. The crest of the dam is approximately 360 feet with a width of 10 feet. The slopes of the embankment are estimated to be 3H:1V upstream and 2H:1V downstream. The spillway is located on the left abutment and is approximately 31 feet wide. The outlet works consists of a gated 24-inch-diameter CMP conduit extending beneath the dam and discharging into the original stream channel.

B. Flood Control Recommendations: (no figure shown) The basin above this area has experienced no deforestation. Therefore it is expected that incoming flows will be passed normally. Since this facility has functioned adequately in the past, no action is recommended.

Normal procedures should continue to be followed regarding monitoring this facility during and after any high intensity storms.

C. Additional Requirements: None.

D. Costs: NA

E. Schedules: NA

SITE NO. SC-14: Tschicoma Dam (Dam #4)

A. Facility Description: Tschicoma Dam is an earthen structure constructed out of local available materials consisting of silty sands and gravels. It is the uppermost structure in a series of four dams on the Santa Clara Creek. The dam is located approximately 8 miles upstream from Pin Dee Dam (Dam #1). The dam height is approximately 25 feet with an estimated storage capacity of about 28 acre-feet. The crest of the dam is approximately 350 feet with a width of 10 feet. The slopes of the embankment are estimated to be 3H:1V upstream and 2H:1V downstream. The spillway is located on the left abutment and is approximately 31 feet wide. The outlet works consists of a gated 24-inch-diameter CMP conduit extending beneath the dam and discharging into the stream channel.

B. Flood Control Recommendations: (no figure shown) The basin above this area has experienced no deforestation. Therefore it is expected that incoming flows will be passed normally. Because this facility has functioned adequately in the past, no action is recommended. Normal procedures should continue to be followed regarding monitoring this facility during and after any high intensity storms

C. Additional Requirements: None.

D. Costs: NA

E. Schedules: NA

SITE NO. SC-15: Sawyer Canyon culvert under State Route 565 (Blacktop Road)

A. Facility Description: Four culverts were inspected along this road. Their sizes are as follows: 48-inch, 36-inch, 48-inch, and 32-inch-diameter CMP. The 36-inch-diameter CMP had a buildup of silt at the entrance but the others appeared clean. The Santa Clara Pueblo representatives expressed concern that the 48-inch CMP culvert where SR 565 crosses Sawyer Canyon was not adequate to convey the anticipated increased flows.

B. Flood Control Recommendations: (See Figure 18) It is recommended that the 48-inch culvert at Sawyer Canyon be replaced with a 98-inch by 69-inch corrugated metal pipe arch (equivalent in cross section to a 96-inch round CMP culvert). Initial work will include saw cutting and removing the existing pavement as required, trench excavation, and salvage of the existing 48-inch CMP culvert (to be delivered to Santa Clara Pueblo). The contractor will install the new CMP arch with end sections, backfilling (including compaction), and hauling and disposing of any excess

material. In addition, after each significant rainfall event, all of the culverts along this road, including the new pipe arch culvert, should be checked and any debris or silt buildup removed.

C. Additional Requirements: The contractor will be responsible for restoring the site to pre-construction conditions, which will include but not be limited to pavement replacement, seeding, and project cleanup. It is anticipated that the road will be closed to traffic for approximately three to four days.

D. Schedules: The time required for this construction is three to four days.

SITE NO. SC-16: Sawyer Creek Reservoir (dry dam)

A. Facility Description: Sawyer Creek Reservoir, an unnamed dry dam located on Sawyer Creek, is an earthen structure constructed out of locally available materials consisting of silty sands and gravels. The dam height is approximately 30 to 40 feet with an estimated storage capacity of about 75 to 100 acre-feet. The crest of the dam is approximately 375 feet with a width of 15 feet. The slopes of the embankment are estimated to be 2H:1V upstream and 2H:1V downstream. This structure has no constructed spillway or outlet works. The left abutment is approximately 5 feet lower than the crest of the dam and therefore would function as an overflow area should the runoff reach this level. No evidence exists that this has ever taken place.

B. Flood Control Recommendations: (See Figure 19) Due to the deforestation of the basin above this structure, the anticipated runoff can be expected to be up to ten times what is normal. Therefore, it is recommended that an emergency spillway channel be constructed adjacent to the left abutment. The channel would be approximately 20 feet wide by 300 feet long with a minimum depth of approximately one foot. The entrance of the channel would be about 100 feet upstream of the left abutment and tie into a natural drainage swale that would carry any overflow around the left abutment to the channel below. The excavated material from this spillway construction should be placed adjacent to the left abutment. This berm will divert any high flows away from the downstream face of the dam.

C. Additional Requirements: None.

D. Costs: No contractor costs were associated with this item because it can be accomplished with tribal labor and equipment. Approximately 225 cubic yards of material will have to be excavated. A bulldozer can easily make this excavation and the material can be disposed of on site adjacent to the left abutment.

E. Schedules: It is estimated that this work can be completed within one day.

SITE NO. SC-17: Fire station

A. Facility Description: Just upstream of Weinpovi Dam exists a fire/ranger station. This facility, which was currently not in use, consists of two buildings, a barracks, and a garage. The barracks appears to be out of the flood plain, but the garage may be affected by the design storm.

B. Flood Control Recommendations: (See Figure 20) Although this facility is no longer

in use, it is recommended that it be protected. Therefore it is recommended that sandbags be placed in front of all doors to prevent potential flooding.

C. Additional Requirements: None.

D. Schedules: It is estimated that this work can be completed within one day.